

Amendments to the Claims

Claim 1. (currently amended) A parallel, semi-continuous or continuous, pressure reactor comprising

a reactor block comprising four or more semi-continuous or continuous reaction vessels for containing ~~a liquid reaction mixture~~ liquid reaction mixtures, each of the four or more reaction vessels being pressurizable to a pressure of not less than about 50 psig,

four or more shaft-driven impellers corresponding to the four or more reaction vessels for stirring the reaction mixtures, and

at least four liquid feed lines in selectable fluid communication with each of the four or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, such that one or more liquid reagents can be selectively fed from the one or more source vessels to each of the four or more reaction vessels during a reaction under reaction conditions.

Claim 2. (currently amended) A parallel, semi-continuous or continuous, pressure reactor comprising

four or more semi-continuous or continuous reaction vessels for containing ~~a liquid reaction mixture~~ liquid reaction mixtures, each of the four or more reaction vessels having a volume of not more than about 1 liter, and being pressurizable to a pressure of not less than about 50 psig,

four or more shaft-driven impellers corresponding to the four or more reaction vessels for stirring the reaction mixtures, and

at least four liquid feed lines in selectable fluid communication with each of the four or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, such that one or more liquid reagents can be selectively fed from the one or more source vessels to each of the four or more reaction vessels during a reaction under reaction conditions.

Claim 3. (currently amended) A parallel, semi-continuous or continuous, pressure reactor comprising

four or more semi-continuous or continuous reaction vessels for containing ~~a liquid reaction mixture~~ liquid reaction mixtures, each of the four or more reaction vessels being pressurizable to a pressure of not less than about 50 psig,

at least four liquid feed lines in selectable fluid communication with each of the four or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, such that one or more liquid reagents can be selectively fed from the one or more source vessels to each of the four or more reaction vessels during a reaction under reaction conditions,

at least one feed-pressurization station pressurizable to a pressure of not less than about 50 psig, at least a portion of each of the at least four liquid feed lines being in selectable fluid communication with the at least one feed-pressurization station, such that ~~the portion of the at least four feed lines can prefeed the one or more liquid reagents to the feed-pressurization station under pressure to prepressurize the portion of~~ said portion of each of the at least four liquid feed lines can be selectively pressurized prior to feeding the one or more liquid reagents to the four or more reaction vessels.

Claim 4. (currently amended) The parallel reactor of claim 3 wherein the feed-pressurization station is station comprises a waste vessel.

Claim 5. (currently amended) The parallel reactor of claims 1 or 2 further comprising at least one feed-pressurization station pressurizable to a pressure of not less than about 50 psig, each of the at least four liquid feed lines being in selectable fluid communication with the at least one feed-pressurization station, such that ~~the at least four feed lines can prefeed the one or more liquid reagents to the feed-pressurization station under pressure to prepressurize the at least four~~ each of said at least four liquid feed lines can be selectively pressurized prior to feeding the one or more liquid reagents to the four or more reaction vessels.

Claim 6. (currently amended) The parallel reactor of claim 5 wherein the feed-pressurization station is station comprises a waste vessel.

Claim 7. (original) The parallel reactor of claims 2 or 3 further comprising a reactor block comprising the four or more semi-continuous or continuous reaction vessels.

Claim 8. (original) The parallel reactor of claim 3 further comprising four or more shaft-driven impellers corresponding to the four or more reaction vessels for stirring the reaction mixtures.

Claim 9. (original) The parallel reactor of claims 3 or 8 wherein each of the four or more reaction vessels has a volume of not more than about 1 liter.

Claim 10. (original) The parallel reactor of claim 9 further comprising a reactor block comprising the four or more semi-continuous or continuous reaction vessels.

Claim 11. (currently amended) The parallel reactor of claim 1 wherein the at least four liquid feed lines are provided to each of the four more reaction vessels through one or more modular feed-line subassemblies, each of the feed-line subassemblies being adapted to releasably engage the reactor block and to support at least two of said liquid feed lines passing into ~~the reaction~~ a respective reaction vessel.

Claim 12. (currently amended) The parallel reactor of claim 11 wherein the one or more modular feed-line subassemblies ~~is a ferrule~~ comprises a ferrule comprising two or more apertures adapted to sealingly support the at least two liquid feed lines when the ferrule is engaged with the reactor block.

Claim 13. (currently amended) A parallel, semi-continuous or continuous, pressure reactor comprising

a reactor block comprising four or more semi-continuous or continuous reaction vessels for containing liquid reaction mixtures, each of the four or more reaction vessels being pressurizable to a pressure of not less than about 50 psig,

four or more shaft-driven impellers corresponding to the four or more reaction vessels for stirring the reaction mixtures, and

at least four liquid feed lines in selectable fluid communication with each of the four or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, such that one or more liquid reagents can be selectively fed from the one or more source vessels to each of the four or more reaction vessels during a reaction under reaction conditions. ~~The parallel reactor of claim 1~~ wherein the at least four liquid feed lines are provided to each of the four or more reaction vessels through one or more ferrules, the reactor block further comprising four or more ~~ferrule-receiving~~ receiving ports adapted to receive a respective one of the ferrules, each of the receiving ports being in fluid communication with a respective one of the reaction vessels, each of the one or more ferrules ~~comprising~~ comprises

a first interior end for insertion into the corresponding receiving port in the reactor block,

a second exterior end substantially opposing the first interior end,

four or more internal apertures extending from the first interior end to the second exterior end for supporting the at least four liquid feed lines passing into a respective one of the reaction vessels, the four or more internal apertures of the ferrule being adapted to ~~sealingly~~ sealingly support ~~each of~~ the at least four liquid feed lines when the ferrule is engaged with the receiving port,

an external side surface including a tapered portion, the tapered portion having a smaller cross-section at positions closer to the first interior end relative to positions farther from the first interior end, the tapered portion being configured to correspond to a tapered surface defining a portion of the receiving port, and

a fastener for releasably engaging at least the tapered portion of the ferrule with the corresponding tapered surface of the receiving port.

Claim 14. (currently amended) The parallel reactor of claim 1 wherein the at least four liquid feed ~~lines are~~ lines comprise capillaries having an inside diameter of not more than about 1 mm.

Claim 15. (currently amended) The parallel reactor of claim 1 wherein the at least four liquid feed ~~lines are~~ lines comprise capillaries having an outside diameter of not more than about 1 mm.

Claim 16. (currently amended) The parallel reactor of claim 1 wherein the at least four liquid feed ~~lines are~~ lines comprise fused silica capillaries.

Claim 17. (currently amended) The parallel reactor of claim 1 wherein the at least four liquid feed ~~lines are~~ lines comprise stainless steel capillaries.

Claim 18. (currently amended) The parallel reactor of claim 1 wherein the at least four liquid feed ~~lines are~~ lines comprise polymer capillaries.

Claim 19. (original) The parallel reactor of claim 1 wherein each of the four or more reaction vessels ~~are defined~~ is defined by or contained in a lower portion of a reaction cavity in the reactor block, the reaction cavity being further defined by an upper portion in the reactor block, the upper portion of the reaction cavity having a larger cross section, taken radially, relative to the lower portion, and the reaction cavity being sized such that two or more of the at least four liquid feed lines can be passed through the upper portion to the lower portion of the reaction cavity.

Claim 20. (currently amended) A parallel, semi-continuous or continuous, pressure reactor comprising

a reactor block comprising four or more semi-continuous or continuous reaction vessels for containing liquid reaction mixtures, each of the four or more reaction vessels being pressurizable to a pressure of not less than about 50 psig,

four or more shaft-driven impellers corresponding to the four or more reaction vessels for stirring the reaction mixtures, and

at least four liquid feed lines in selectable fluid communication with each of the four or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, such that one or more liquid reagents can be selectively fed from the one or more source vessels to each of the four or more reaction vessels during a reaction under reaction conditions,

wherein each of the four or more reaction vessels is defined by or contained in a lower portion of a reaction cavity in the reactor block, The parallel reactor of claim 19 wherein the lower portion of the reaction cavity has a substantially circular cross section, taken radially, the

reaction cavity being further defined by an upper portion in the reactor block, wherein [[and]] the upper portion of the reaction cavity has a substantially oval cross section, taken ~~radially~~ radially, the upper portion of the reaction cavity having a larger cross section, taken radially, relative to the lower portion, and the reaction cavity being sized such that two or more of the at least four liquid feed lines can be passed through the upper portion to the lower portion of the reaction cavity.

Claim 21. (currently amended) The parallel reactor of claim 1 wherein each of the four or more reaction vessels ~~are defined~~ is defined by or contained in a reaction cavity in the reactor block, the reaction cavity having a substantially uniform cross section, taken radially.

Claim 22. (currently amended) The parallel reactor of claim 21 wherein the reaction ~~cavity is~~ cavity comprises a cylindrical reaction cavity.

Claim 23. (currently amended) The parallel reactor of claim 1 wherein ~~the least~~ each of the at least four liquid feed lines in fluid communication with each of the four or more reaction vessels ~~comprise~~ comprises at least a first section and a second section in fluid communication with each other, the second section being ~~releasably engaged with~~ releasable with respect to the first section and having a distal end positioned within the reaction vessel.

Claim 24. (original) The parallel reactor of claim 23 wherein the first section is positioned such that it is outside of the reaction vessel, and additionally or alternatively, at least substantially uncontaminated by the liquid reaction mixture.

Claim 25. (original) The parallel reactor of claim 23 wherein the first section is positioned such that at least a portion thereof is inside a reaction cavity that contains or defines the reaction vessel.

Claim 26. (currently amended) A parallel, semi-continuous or continuous, pressure reactor comprising

a reactor block comprising four or more semi-continuous or continuous reaction vessels for containing liquid reaction mixtures, each of the four or more reaction vessels being pressurizable to a pressure of not less than about 50 psig,

four or more shaft-driven impellers corresponding to the four or more reaction vessels for stirring the reaction mixtures, and

at least four liquid feed lines in selectable fluid communication with each of the four or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, such that one or more liquid reagents can be selectively fed from the one or more source vessels to each of the four or more reaction vessels during a reaction under reaction conditions, wherein each of the least four liquid feed lines in fluid communication with each of the four or more reaction vessels comprises at least a first section and a second section in fluid communication with each other, the second section being releasable with respect to the first section and having a distal end positioned within the reaction vessel, and ~~The parallel reactor of claim 23 wherein the first section is~~ section comprises a polymer capillary and the second section is ~~section comprises~~ a stainless steel capillary.

Claim 27. (currently amended) The parallel reactor of claim 1 wherein each of the least four liquid feed lines has a distal end positioned within the reaction vessel, the distal ~~end for~~ end of one or more of the liquid feed lines being positioned lower in the reaction vessel relative to the distal end of one or more other of the liquid feed lines.

Claim 28. (currently amended) The parallel reactor of claim 27 wherein the distal end ~~for~~ one of one or more of the liquid feed lines is positioned in the reaction vessel such that feed is delivered through such one or more liquid feed lines directly into the liquid reaction mixture, and the distal end of one or more other of the liquid feed lines is positioned in the reaction vessel such that feed is delivered through such one or more other liquid feed lines into a gaseous headspace above the liquid reaction mixture.

Claim 29. (currently amended) The parallel reactor of claim 1 wherein the inside diameter or cross-sectional flow area ~~for one of one~~ of one or more of the at least four liquid feed lines is different from the inside diameter or cross-sectional flow area for another of the at least four liquid feed lines.

Claim 30. (currently amended) The parallel reactor of claim 1 wherein each of the at least four liquid feed lines ~~each have a~~ has a substantially circular cross-sectional area, the inside diameter ~~for one of one~~ of one or more of the liquid feed lines is less than about 500 μm , and the inside diameter for another of the liquid feed lines is about 500 μm or more.

Claim 31. (currently amended) The parallel reactor of claim 1 further comprising a parallel feed-line interface providing fluid communication between a first section and a second section of each of at least four liquid feed lines, the interface being ~~releasably connected to~~ releasable with respect to the first section and additionally or alternatively, to the second section, of each of the at least four liquid feed lines.

Claim 32. (original) The parallel reactor of claim 1 wherein at least one liquid feed line for each of the four or more reaction vessels is in direct fluid communication with a liquid reagent source vessel.

Claim 33. (original) The parallel reactor of claim 1 further comprising at least one feed distribution valve providing selective fluid communication between one or more liquid reagent source vessels and at least one liquid feed line for each of the four or more reaction vessels.

Claim 34. (currently amended) The parallel reactor of claim 1 further comprising at least one syringe-type feed pump for feeding one or more liquid reagents from one or more source vessels through one or more of the liquid feed lines to the selected one or more reaction vessels.

Claim 35. (currently amended) The parallel reactor of claim 1 wherein ~~each of the four or more reaction vessels are~~ vessels comprise semi-continuous flow reaction vessels.

Claim 36. (currently amended) The parallel reactor of claim 1 wherein ~~each of the four or more reaction vessels are~~ vessels comprise continuous-flow reaction vessels.

Claim 37. (currently amended) The parallel reactor of claim 1 further comprising four or more gas ports, each of the four or more gas ports providing fluid communication to a respective one of the four or more reaction vessels.

Claim 38. (currently amended) The parallel reactor of claim 1 further comprising four or more pairs of gas ports, each of the pairs of gas ports providing fluid communication with a respective one of the four or more reaction vessels.

Claim 39. (currently amended) The parallel reactor of claim 37 wherein each of the ~~four or more the four or more~~ gas ports ~~are gaseous feed ports, pressure monitoring ports, pressure control ports or gaseous purge ports~~ comprises a gaseous feed port, a pressure monitoring port, a pressure control port, or a gaseous purge port.

Claim 40. (currently amended) The parallel reactor of claim 1 further comprising four or more discharge lines, each of the four or more discharge lines providing fluid communication to a respective one of the four or more reaction vessels.

Claim 41. (original) The parallel reactor of claim 1 wherein the four or more reaction vessels comprise wells formed in the reactor block.

Claim 42. (currently amended) The parallel reactor of claim 1 wherein the four or more reaction ~~vessels are~~ vessels comprise removable liners supported by wells formed in the reactor block, each of the liners having an interior surface defining a cavity for containing a respective one of the liquid reaction mixtures, and an external surface dimensioned to fit within the wells.

Claim 43. (currently amended) The parallel reactor of claim 42 wherein the removable ~~liners are~~ liners comprise glass vials.

Claim 44. (original) The parallel reactor of claim 1 wherein each of the four or more reaction vessels has an aspect ratio (L/D) of at least about 1.5.

Claim 45. (original) The parallel reactor of claim 1 wherein each of the four or more reaction vessels has an aspect ratio (L/D) of at least about 2.

Claim 46. (currently amended) The parallel reactor of claim 1 wherein the reactor block comprises a base block comprising four or more wells defining or containing the four or more reaction vessels, and a header block positioned over the base block to form four or more pressurizable reaction cavities, each of the four or more reaction cavities defining or containing a respective one of the four or more reaction vessels.

Claim 47. (currently amended) The parallel reactor of claim 46 wherein the header block ~~comprises~~ supports the four or more shaft-driven impellers.

Claim 48. (currently amended) The parallel reactor of claim 47 further comprising a disposable header gasket situated between the base block and the header block, the disposable header gasket including four or more masking regions corresponding to the four or more reaction ~~cavities~~ cavities, each of the four or more masking regions being adapted to mask ~~the portion a~~ a portion of the header block exposed to ~~the reaction~~ a respective reaction cavity.

Claim 49. (currently amended) The parallel reactor of claims 1, 47 or 48 further comprising four or more disposable shaft covers corresponding to the four or more shaft-driven impellers, each of the four or more shaft covers being adapted to mask at least a non-disposable portion of a shaft of ~~the shaft-driven~~ a respective shaft-driven impeller ~~exposed to the reaction~~ received in a respective reaction cavity.

Claim 50. (currently amended) The parallel reactor of claim 11 wherein the reactor block comprises a base block comprising four or more wells defining or containing the four or more reaction vessels, and a header block positioned over the base block to form four or more pressurizable reaction cavities, each of the four or more reaction cavities defining or containing a respective one of the four or more reaction vessels, the header block further comprising four or

more feed-line subassembly receiving ports adapted to receive ~~one of the~~ respective modular feed-line subassemblies.

Claim 51. (original) The parallel reactor of claim 1 wherein each of the four or more reaction vessels has a volume of not more than about 500 ml.

Claim 52. (original) The parallel reactor of claim 1 wherein each of the four or more reaction vessels has a volume ranging from about 1 ml to about 100 ml.

Claim 53. (currently amended) The parallel reactor of claim 1 wherein each of the four or more reaction ~~vessels are~~ vessels is pressurizable to a pressure of not less than about 400 psig.

Claim 54. (currently amended) The parallel reactor of claim 1 wherein each of the four or more reaction ~~vessels are~~ vessels is pressurizable to a pressure ranging from about 500 psig to about 1500 psig.

Claim 55. (original) The parallel reactor of claim 1 wherein the reactor block further comprises one or more temperature control elements for individual or modular temperature control of the four or more reaction vessels.

Claim 56. (currently amended) A parallel, semi-continuous or continuous, pressure reactor comprising

a reactor block comprising a base block and a header block, the base block comprising eight or more wells, each of the eight or more wells containing a removable reaction vessel for containing a liquid reaction mixture, the reaction vessels having a volume of not more than about 1 liter, the header block being removably positioned over the base block for access to the reaction vessels and for forming eight or more pressurizable reaction cavities that include the eight or more wells containing the reaction vessels, the reaction cavities being pressurizable to a pressure of not less than about 100 psig,

eight or more shaft-driven impellers corresponding to the eight or more reaction vessels for stirring the reaction mixtures, the eight or more shaft-driven impellers being supported by the header block,

at least four liquid feed lines in selectable fluid communication with each of the eight or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, and

eight or more modular feed-line subassemblies releasably received in receiving ports in the header block, each of the eight or more feed-line subassemblies being adapted to releasably engage the header block, to sealingly support the at least four liquid feed lines feeding a respective reaction vessel, ~~and to provide the at least four liquid feed lines to each of the eight or more reaction vessels through a feed-line subassembly receiving port formed in the header block.~~

Claim 57. (currently amended) The parallel reactor of claim 56 wherein the reactor ~~block~~ is block comprises a first modular reactor block, the parallel reactor comprising one or more additional modular reactor blocks, each of the one or more additional modular reactor blocks comprising

a base block and a header block, the base block comprising eight or more wells, each of the eight or more wells containing a removable reaction vessel for containing a liquid reaction mixture, the reaction vessels having a volume of not more than about 1 liter, the header block being removably positioned over the base block for access to the reaction vessels and for forming eight or more pressurizable reaction cavities that include the eight or more wells containing the reaction vessels, the reaction cavities being pressurizable to a pressure of not less than about 100 psig, and corresponding thereto,

eight or more shaft-driven impellers corresponding to the eight or more reaction vessels for stirring the reaction mixtures, the eight or more shaft-driven impellers being supported by the header block,

at least four liquid feed lines in selectable fluid communication with each of the eight or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, and

eight or more modular feed-line subassemblies releasably received in receiving ports in the header block, each of the eight or more feed-line subassemblies being adapted to releasably engage the header block, to sealingly support the at least four liquid feed lines feeding a respective reaction vessel, ~~and to provide the at least four liquid feed lines to each of the eight or more reaction vessels through a feed-line subassembly receiving port formed in the header block.~~

Claim 58. (currently amended) A parallel, semi-continuous or continuous reactor comprising

four or more semi-continuous or continuous reaction vessels for containing ~~a liquid reaction mixture~~ liquid reaction mixtures, each of the four or more reaction vessels having a volume of not ~~more than~~ more than about 1 liter,

at least four liquid feed lines in selectable fluid communication with each of the four or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels,

four or more modular feed-line subassemblies releasably received in receiving ports in the reaction vessels or in a reactor block that defines or contains the reaction vessels, each of the four or more feed-line subassemblies ~~being adapted to releasably engage one of the four or more reaction vessels or a reactor block that defines or contains the reaction vessels, each of the feed-line subassemblies~~ supporting two or more of the at least four liquid feed lines feeding a respective reaction vessel ~~, and~~

~~providing the two or more liquid feed lines to the reaction vessels through a feed line subassembly receiving port formed in the reaction vessel or the reactor block.~~

Claim 59. (currently amended) A parallel, semi-continuous or continuous reactor comprising

four or more semi-continuous or continuous reaction vessels for containing ~~a liquid reaction mixture~~ liquid reaction mixtures, each of the four or more reaction vessels having a volume of not more than about 1 liter,

at least four liquid feed lines in selectable fluid communication with each of the four or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, each of the at least four liquid feed lines comprising at least a first section and a second section in fluid communication with each other, the second section being ~~releasably engaged with~~ releasable with respect to the first section and having a distal end positioned within a respective one of the reaction vessels.

Claim 60. (currently amended) A parallel, semi-continuous or continuous reactor comprising

four or more semi-continuous or continuous reaction vessels for containing a liquid reaction mixture liquid reaction mixtures, each of the four or more reaction vessels having a volume of not more than about 1 liter,

at least four liquid feed lines in selectable fluid communication with each of the four or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, each of the at least four liquid feed lines having a distal end positioned within the reaction vessel, the distal ~~end for~~ end of one or more of the liquid feed lines being positioned lower in the reaction vessel relative to the distal end of one or more other of the liquid feed lines.

Claim 61. (currently amended) A parallel, semi-continuous or continuous reactor comprising

four or more semi-continuous or continuous reaction vessels for containing a liquid ~~reaction mixture~~ liquid reaction mixtures, each of the four or more reaction vessels having a volume of not more than about 1 liter,

at least four liquid feed lines in selectable fluid communication with each of the four or more reaction vessels, each of the at least four liquid feed lines being in fluid communication with one or more liquid reagent source vessels, one or more of the at least four liquid feed lines having an inside diameter or cross-sectional flow area that differs from the inside diameter or cross-sectional flow area for another of the at least four liquid feed lines.

Claim 62. (original) The parallel reactor of claims 58, 59, 60 or 61 further comprising four or more shaft-driven impellers corresponding to the four or more reaction vessels for stirring the reaction mixtures.

Claim 63. (currently amended) The reactor of claims 58, 59, 60 or 61 wherein the four or more reaction ~~vessels are~~ vessels comprise semi-continuous flow reaction vessels.

Claim 64. (currently amended) The parallel reactor of claims 58, 59, 60 or 61 wherein the four or more reaction ~~vessels are~~ vessels comprise continuous flow reaction vessels.

Claim 65. (currently amended) The parallel reactor of claim 58, 59, 60 or 61 wherein the four or more reaction ~~vessels are~~ vessels comprise removable liners supported by ~~a well~~ wells formed in a reactor block, each of the liners having an interior surface defining a cavity for containing ~~the liquid~~ a respective liquid reaction mixture, and an external surface dimensioned to fit within ~~the well~~ a respective well.

Claim 66. (original) The parallel reactor of claim 58, 59, 60 or 61 wherein the four or more reaction vessels are formed in a reactor block, the reactor block further comprising one or more temperature control elements for individual or modular temperature control of the four or more reaction vessels.

Claim 67. (currently amended) The parallel reactor of claim 58, 59, 60 or 61 wherein each of the four or more reaction ~~vessels are~~ vessels is hermetically sealable.

Claim 68. (currently amended) The parallel reactor of claim 58, 59, 60 or 61 wherein each of the four or more reaction ~~vessels are~~ vessels is pressurizable to a pressure of not less than about 50 psig.

Claims 69-85 (canceled)